A Survey of Value Sensitive Design Methods

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To Nan and to Jeff
To Karen
To Charline and Marion

Contents

Abstract

Value sensitive design is a theoretically grounded approach to the design of technology that accounts for human values in a principled and systematic manner throughout the design process. In this article we provide a survey of 14 value sensitive design methods: (1) direct and indirect stakeholder analysis; (2) value source analysis; (3) co-evolution of technology and social structure; (4) value scenario; (5) value sketch; (6) value-oriented semi- structured interview; (7) scalable information dimensions; (8) value-oriented coding manual; (9) value-oriented mock-up, prototype, or field deployment; (10) ethnographically informed inquiry regarding values and technology; (11) model of informed consent online; (12) value dams and flows; (13) value sensitive action-reflection model; and (14) Envisioning Cards ^{TM}. Each of these methods is honed to the investigation of values in technology, serving such purposes as stakeholder identification and legitimation, value representation and elicitation, and values analysis. While presented individually, the methods are intended to be integrated in a robust value sensitive design process. The survey article begins with a brief summary of value sensitive design methodology and theoretical constructs. We next provide an overview of the 14 methods. Then, we turn to a broader discussion of value sensitive design practice, focussing on some methodological strategies and heuristics to support skillful value sensitive design practice. Following the broad discussion of practice, we illustrate one method in action—value scenarios—providing details on its range of purposes and contexts. We conclude with reflections on core characteristics of value sensitive design methodology, and heuristics for innovation.

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Introduction

Value sensitive design is a theoretically grounded approach to the design of technology that accounts for human values in a principled and systematic manner throughout the design process (Friedman et al., 2006a; Davis and Nathan, 2014). Under development since the mid 1990s, value sensitive design has been applied to a wide range of projects, including browser privacy and informed consent, implantable medical devices, and information systems for transitional justice. Throughout, methods for research and design have been developed. Often, familiar methods from the social sciences, human-computer interaction, security, and other disciplines have been adopted or adapted; at other times, new methods have been invented. While a substantial value sensitive design literature exists, no survey of these methods has yet been written. This article seeks to fill a portion of this gap by bringing together a collection of 14 value sensitive design methods, along with strategies and heuristics for skillful practice.

The core concern of value sensitive design is to address human values in the technical design process. Given this point of view, designers, researchers and engineers are likely to face questions of these kinds: How can I explore the technical and policy design space from

the perspective of human values? How can I identify stakeholders and legitimate this choice? How do I elicit stakeholder views and values? How do I resolve value tensions among stakeholders? How do I translate stakeholder values into technical design decisions?

Over the years a number of other approaches that are oriented to similar concerns have been developed (Davis and Nathan, 2014; Snyder et al., 2016; Huldtgren, 2015), including Values in Design (Nissenbaum, 2001), Values for Design (van den Hoven et al., 2015), and Worth-Centred Design (Cockton, 2009). According to van den Hoven (2015), these approaches and value sensitive design share at least four key claims: values can be expressed and embedded in technology, technologies have real and sometimes non-obvious impacts on those who are directly and indirectly affected, explicit thinking about the values that are imparted in technical design is morally significant, and value considerations should be surfaced early in the technical design process. Across a broad range of values, stakeholders, and technologies, value sensitive design is arguably the most widely used and extensively explored of these approaches.

One of the key contributions of value sensitive design is the identification and development of a set of targeted methods for engaging values in the context of technology. Over the past twenty years, a wide variety of methods have been used in the service of value sensitive design. A good many of these have come from the social sciences, including anthropology, sociology, and moral and social psychology (e.g., semi-structured interviews); and from design approaches such as participatory design (e.g., Future Workshops). Despite the strength of methods from these established fields, on occasion value sensitive design researchers found themselves facing a design challenge without a clear path for going forward. In those instances, the general strategy was to adapt existing methods when possible, or when needed to invent new methods that were particularly suited to engaging values in the technical context. The 14 methods surveyed in this article fit in this category.

1.1 On Method and Practice

The *Oxford English Dictionary* [2011] defines "method" as follows:

> *Method (n).* A special form of procedure or characteristic set of procedures employed (more or less systematically) in an intellectual discipline or field of study as a mode of investigation and inquiry, or of teaching and exposition.

This definition foregrounds several qualities of method in value sensitive design. First, value sensitive design methods in their descriptive forms provide guidance on how to engage in a particular kind of research or design inquiry. Thus, methods help designers focus their attention on critical elements of the design situation, positioning designers to obtain design insights. In their descriptive forms, methods and their outcomes can be scrutinized and compared with other methods. But methods also unfold as human activity. As such, the execution of a method may correspond more or less closely to its descriptive form. Thus, the use of a method always involves a kind of skillful performance that is learned. An expert will likely use a method differently than a novice.

A second quality of value sensitive design methods is that they are informed by the theoretical constructs of value sensitive design. Thus, to use a method well requires being faithful to value sensitive design theory. Here "being faithful" does not refer to some kind of easily recognized conformance; instead, it refers to a genuine engagement with theory. Thus, for example, a theoretical commitment in value sensitive design is to identify and legitimate the direct and indirect stakeholders in a design project. Accordingly, to do so, many different empirical and analytic methods might be employed, depending on the design situation. As methods are employed, new knowledge is generated that, in turn, informs theory—precipitating clarifications, extensions, revisions, adaptations, and even new dimensions. In so doing, theory and method engage in an ongoing dialog, each a tool to shape and reshape the other.

A third quality concerns the practical use of methods within value sensitive design. Value sensitive design methods are intended to

be integrated with other methods and processes in technical design. Relatedly, value sensitive design methods are intended to be open to adaption and evolution so that their use is responsive to the elements of the design situation.

In summary, the methods codify and operationalize how researchers, designers, and engineers can proceed to engage values in technical design.

1.2 Summary of Key Theoretical Constructs

Method positions researchers and designers to act in ways responsive to the considerations foregrounded by theory. For value sensitive design, as with many other theoretically informed approaches, method arises from theoretical constructs and, in turn, the use of method drives the development of theory. Thus, to position designers and researchers to employ value sensitive design methods, we begin with a brief summary of the key theoretical constructs of value sensitive design. A fuller explication of each construct, including nuances and limitations, can be found in Friedman and Hendry (forthcoming).

Tools and Technology. While the boundary between tools and technology is not a sharp one, as a heuristic, one might think of *tools* in their simpler sense as human-scale physical artifacts that augment human activity and *technology* as extending our ideas about tools to include the application of scientific knowledge to solve practical problems, including the specific methods, materials, and devices employed. *Infrastructure*—the basic physical and organizational structures and facilities needed for the operation of a society or enterprise—also needs consideration. Taken together, tools, technology, and infrastructure comprise what some might term a technological system. When speaking of one—tool, technology, or infrastructure—it is nearly impossible not to speak of the others. In value sensitive design, the term technology is used as a shorthand to refer to all three and their interdependencies.

At its core, value sensitive design is not tied to any specific technology. Accordingly, designers, researchers, and engineers working with

diverse technologies can employ value sensitive design theory and methods.

Human Values. The current working definition of "value" within value sensitive design is:

> *what is important to people in their lives, with a focus on ethics and morality.*

Moreover, within lived life, human values do not exist in isolation, with, for example, privacy over here and security or community over there. Rather, in the complexity of human relations, values sit in a delicate balance with each other. This framing positions designers and researchers to emphasize moral and ethical values, but to do so within the complexity of social life, and with recognition for how culture and context implicate people's understanding and experience of benefits as well as harms and injustice.

Interactional Stance. Value sensitive design takes an interactional stance on technology and human values. Unlike approaches based primarily on technological determinism or on social determinism, interactional theories such as value sensitive design posit that human beings acting as individuals, organizations, or societies shape the tools and technologies they design and implement; in turn, those tools and technologies shape human experience and society.

The Tripartite Methodology: Conceptual, Empirical, and Technical Investigations. To address the value implications of socio-technical design robustly, value sensitive design employs an *iterative* methodology that *integrates* conceptual, empirical, and technical investigations. Conceptual investigations comprise analytic, theoretical, or philosophically informed explorations of the central issues and constructs under investigation. Empirical investigations examine the human context in which the technology is situated and, as appropriate, may draw upon the entire range of quantitative and qualitative methods used in social science research. Technical investigations focus on the technology as the unit of analysis, typically involving retrospective analysis of existing technology or proactive design of new technology.

Stakeholders: Whose values? Value sensitive design asks designers to seek out a robust set of stakeholder groups and to legitimate those

who likely are most strongly affected—that is, to provide an analytic or empirical rationale for their inclusion in a design process. Equally important can be the rationale provided for why certain groups or individuals are not engaged. Value sensitive design also asks designers to be transparent about explicitly supported project values and their own individual values (i.e., designer values). In any stakeholder analysis, a central distinction concerns stakeholders who directly interact with a system, the *direct stakeholders*, and those who, although they never or rarely interact with the system as end-users, are nevertheless affected by the system, the *indirect stakeholders*.

Value Tensions. Human values do not exist in isolation. Rather, much like the threads in a spider web, values are situated in a delicate balance. Touching one value implicates others. Moreover, people's values can align or come into tension at various levels of human experience—within an individual; among individuals; between an individual and a group; among groups, institutions, nations, and societies; and any number of other combinations. Adding yet another layer of complexity, the balance among the values of a person, group, or society may change over time, and value tensions may shift accordingly. While how to achieve balance among competing values is not obvious, value sensitive design frames a design process that engages constructively with the tensions.

Co-evolving Technology and Social Structure. The interactional stance of value sensitive design implies that the design space for technological innovation encompasses not only the technical design space but also the corresponding socio-structural one. Moreover, engaging both technical and socio-structural design spaces with the tools and methods of value sensitive design provides a more comprehensive design space—one with the possibility for solutions that might not be conceived of (or even possible) if approached from a technical or socio-structural perspective alone.

Multi-lifespan Design. Multi-lifespan design begins from the observation that certain categories of problems, such as healing from widespread or cyclical violence (e.g., genocide) or some environmental issues (e.g., regeneration of old growth forests) are unlikely to be solved

within a single human lifespan. Correspondingly, technology developed and deployed in the service of such solutions as they unfold will need to be robust and adaptive over time. Situated within value sensitive design, multi-lifespan design provides specific design knowledge and methods honed to a longer-term timeframe. Such work opens up new opportunities for preserving knowledge, supporting social structures and processes, remembering and forgetting, and re-envisioning infrastructure to support inclusivity and access.

Progress, not Perfection. The motto "progress, not perfection" is relevant to all aspects of value sensitive design practice. This motto encapsulates an overarching perspective and strategy for navigating the at times daunting challenges of addressing values in technical work, reminding designers that achieving progress is a worthy goal even though perfection remains ever elusive. Value sensitive design moves designers toward the conceptualizations needed to identify shortcomings in current design processes and to seek remedies that promote human well-being. It moves designers toward the language needed to discuss the often immense social consequences of technical innovation with the public at large. And, it moves designers toward considering human values as a design criterion—along with traditional criteria of reliability, efficiency, and correctness—by which systems may be judged poor and designers negligent. As with the traditional criteria for evaluating technical systems, we need not require perfection, but commitment to practice. And through practice, progress.

1.3 Bounding the Article

The central contribution of this survey article is to provide an overview of 14 methods in value sensitive design and to provide a broader discussion of value sensitive design practice. Specifically, we focus on methods that have been invented for the investigation of values in technology (e.g., value dams and flows, envisioning cards) or methods that have undergone substantial adaptation or development (e.g., value-oriented semi-structured interviews, value sketches).

The collection of methods surveyed here, while representative, is not complete. The value sensitive design literature is large and experiencing rapid growth. For example, a Google Scholar search in October 2017 on the phrase "value sensitive design" returned over 3,500 works. A similar Google Scholar search on "value sensitive design" by year for 2015 and for 2016 returned over 400 new works for each year; the pattern seems to be continuing for 2017. Methodological development and innovation is rich within this body of work. Methods engage, for example, transcultural and cross-cultural design (Abokhodair and Vieweg, 2016; Pereira and Baranauskas, 2015; Burmeister, 2013; Alsheikh et al., 2011); health informatics (Burmeister, 2016; Fitzpatrick et al., 2015; Novitzky et al., 2015; Pakrasi et al., 2015; Schikhof et al., 2010; Teipel et al., 2016); care robots in health settings (van Wynsberghe, 2013, 2015; Felzmann et al., 2016); empowerment and marginalization in crowd-work (Deng et al., 2016); appropriation within action research (Weibert et al., 2017); embedding ethical and moral considerations throughout the software development lifecycle (Spiekermann, 2015; Harbers et al., 2015); responsible innovation and value sensitive design (van den Hoven, 2013); and other developments (e.g., Walldius and Lantz, 2013; Shilton, 2012; van de Poel, 2013; Solomon, 2014). We leave an analysis of this broader value sensitive design literature to other scholars.

The remainder of this article is organized as follows. In Chapter 2 we begin by introducing the collection of methods, organizing them by purpose, and citing the original publications. Then, in Chapter 3 we provide some methodological strategies and heuristics to support skillful value sensitive design practice. In Chapter 4 we illustrate one method in action, providing details on that method's use for a range of purposes and contexts. Finally, we conclude in Chapter 5 with reflections on core characteristics of value sensitive design methods, and heuristics for methodological innovation.

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